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The Zone Comparison Test (ZCT), a psychophysiological detection of deception (PDD) test, was administered to 20 subjects who were programmed to be deceptive or non-deceptive. This pilot study was designed to determine the effectiveness of the coin theft as a mock crime scenario for laboratory tests with the ZCT. The scenario instructions and pretest were videotaped. The test questions were presented using digitized voice. PDD tests were blind-evaluated by two independent scorers using the 3 position, ZCT scoring method. The frequencies of accurate determinations were compared using proportionality tests. The scorers rendered a decision in 62% of the cases, and were unable to reach a decision (inconclusive calls) in 38% of the cases. When inconclusives were excluded, the average accuracy was 84%, significantly better than chance ($p < .05$). Neither scorer achieved an accuracy rate better than chance level. Interrater agreement was found to be nonsignificant (κ for multiple raters, $p > .05$). Despite the high accuracy rate found when inconclusives were excluded, the inconclusive rate and low interrater agreement rates suggest that this is not an effective laboratory mock crime procedure.

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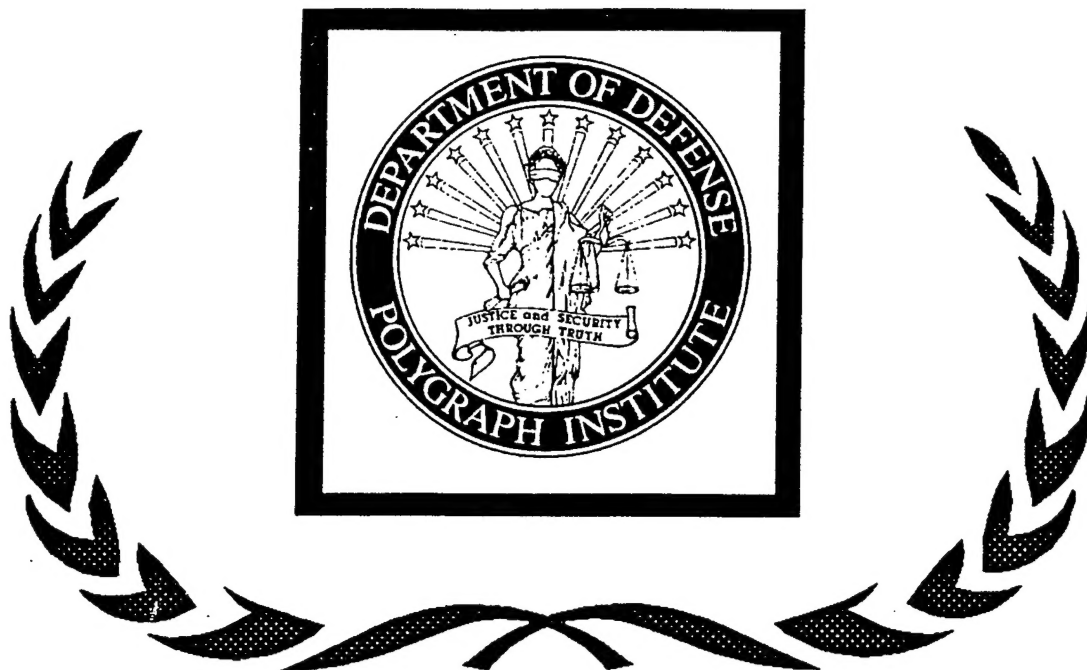
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Director's Foreword

A perpetual problem with the psychophysiological detection of deception (PDD) discipline has been the shortage of supporting scientific research. Unfortunately, the research that does exist has frequently produced inconsistent or equivocal results. It is difficult, when evaluating such research, to determine why seemingly similar studies produced disparate results. One factor that may contribute to the disparate results among studies is the way subjects are manipulated.

In a typical laboratory study subjects participate in a procedure, usually called a mock crime, and then attempt to deceive the PDD examiner concerning their participation. The mock crime procedures used vary among reports, as do the reported accuracy rates of the subsequent PDD examinations. The results described in the reports are, at least to some extent, dependent on the efficacy of the mock crime procedure used. Use of the same mock crime procedure in multiple studies would greatly reduce the possibility that differences among study results were due to the use of different mock crime procedures. Such a "standard" procedure should be developed to have both validity and reliability. This report describes the first of a series of studies designed to develop and evaluate a "standard" mock crime procedure for use in multiple laboratory investigations. It is emphasized that this procedure is for use in the laboratory. It is, consequently, more important that the procedure produces valid reliable decisions than it is that the procedure emulates real life situations.



Michael H. Capps
Director

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Abstract

INGRAM, E. M. Test of a mock theft scenario for use in the psychophysiological detection of deception: I. May 1996, Report No. DoDPI96-R-0003. Department of Defense Polygraph Institute, Ft. McClellan, AL 36205.-- The Zone Comparison Test (ZCT), a psychophysiological detection of deception (PDD) test, was administered to 20 healthy male and female soldier trainees programmed to be either deceptive or non-deceptive using the mock theft of a valuable coin. This pilot study was designed to determine the effectiveness of the coin theft as a mock crime scenario for laboratory tests with the ZCT. The scenario instructions and pretest were videotaped and presented to the subjects. The test questions were presented to the subjects using digitized voice. PDD tests were blind-evaluated by two independent scorers using the 3 position, ZCT scoring method. The frequencies of accurate determinations made were compared using proportionality tests. The independent scorers rendered a decision in 62% of the cases, and were unable to reach a decision (inconclusive calls) in 38% of the cases. When inconclusives were excluded, the average accuracy was found to be 84%, and was significantly better than chance ($p < .05$). However, neither independent scorer achieved an overall accuracy rate better than a chance level. Additionally, interrater agreement was found to be non-significant using the kappa statistic for multiple raters ($p > .05$). Despite the high accuracy rate found when inconclusives were excluded, the relatively high inconclusive rate, and low interrater agreement suggest that this procedure is not an effective laboratory mock crime procedure.

Key Words: psychophysiological detection of deception, mock crime scenarios, Zone Comparison Test

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The psychophysiological detection of deception (PDD) literature has focused on the issues of accuracy and validity without paying much attention to effects resulting from the use of a variety of different mock scenarios (simulations of the commission of different crimes) in PDD analog studies. Since each mock scenario is unique to the study in which it is used, any differences among various analog studies can potentially be attributed to characteristics of the mock scenario. The Office of Technology Assessment (OTA), summarized the results of 14 studies using mock crime scenarios, and reported that there was considerable variability in the accuracy rates found by different researchers (OTA, 1983). They also reported that the percentage of subjects identified correctly in laboratory studies was over 20% lower than the percentage in field studies (61% to 82% for analog and field studies respectively). Therefore, given these kinds of findings, it is not unusual that several researchers have in the past agreed that analog studies cannot be used to estimate the validity of the control question test (CQT) (Furedy & Heslegrave, 1991; Lykken, 1981; and Iacono, 1991).

In addition to the variation in the types of mock scenarios, one component of the mock scenario that has also varied widely is the incentive used to induce the individual to defeat the PDD test. It has generally been the practice in PDD studies to provide money as an incentive. However, the amounts as well as the types of incentives have varied considerably (Kircher, Horowitz, & Raskin, 1988). In a meta analysis of mock crime studies Kircher et al. (1988) cite several studies that provide an exception to the use of money (Ginton, Netzer, Elaad, & Ben-Shakar, 1982; Honts, Raskin & Kircher, 1983; and Honts & Carlton, 1990). Ginton et al. (1982) used threat to one's career. Honts et al. (1983) used college course credit. Honts and Carlton (1990) using soldier trainees as subjects contrasted no time off from duties against time off from duties as an incentive to defeat the PDD exam. The effects of these treatments range from no significant effect to 100% effective (Ginton et al. 1982, this study, however, had only two subjects). This lack of extensive systematic examination of the effects of scenarios and incentives has allowed researchers in PDD to attribute the different accuracy's found among analog studies, and between analog and field studies, to a wide variety of factors (OTA, 1983).

For instance, some of these factors have been the differences in the crime situations; differences in the testing situations; the differences in subject populations among analog studies, and most importantly the different consequences for "suspects" that exists between analog and field studies (OTA, 1983). In other words, problems in the assessment of validity using analog studies and field studies have been found to be due to factors associated primarily with external validity (OTA, 1983). Consequently, since external validity refers primarily to the generalizability of results, external validity among analog studies and field studies would most likely be increased if the

repeatability of the outcomes of analog studies increased. The repeatability of analog study outcomes could be better assessed if the mock scenarios used in analog studies were standardized. The use of standard scenarios would likely increase what Bracht and Glass (1968) refer to as ecological external validity.

Bracht and Glass (1968) see the ecological validity aspect of external validity as referring to the representativeness of experimental findings. For PDD this means that the range of variability in accuracy rates found in reports of laboratory research would be reduced. Laboratory results would, therefore, be more readily generalizable, especially to the field since the treatment of subjects in different studies would be the same.

The development of standardized mock scenarios would also positively impact the development of new techniques for the detection of deception. Effective and reliable mock events are needed, since no testing approaches have been developed for use with a number of potentially new procedures and instruments (i.e., methods involving EEG, voice stress, eye-tracking, and new cardiac measures). In order to conduct credible research in the validity of PDD and to accurately assess new methods and instrumentation, an independent treatment is needed that will result in a change in a dependent measure that can actually be measured consistently. This would necessitate a situation in which the subject engages in some behavior that is later denied. Whether or not a mock crime, or some other experimentally designed scenario is used is less important than consistency in the observed behavior. It is essential that the requisite behavior being tested for does not change significantly from study to study because of factors unique to the particular scenario being used. It is also necessary to choose a scenario design that provides sufficient control to allow the results to be interpretable. This design must also maintain enough realism for research findings to be generalized to field or real life settings. Therefore, developing standardized mock scenarios is a significant step toward meeting the need to generalize among analog studies and from analog studies to the field.

The objective of the pilot research conducted here was to test the effectiveness of a mock theft scenario. Two goals exist for a set of procedures to serve as a standardized scenario, and they are that the procedure (a) result in high accuracy (80% or better), and (b) that the high accuracy rate be consistently repeatable. This study tested the scenario with respect to the first goal. Specifically, the pilot study conducted here was designed to determine the effectiveness of a subject programming scenario in producing an accuracy rate of 80% or better.

Method

Subjects

Twenty-one male and female U.S. Army trainees [mean age (SD) = 22.92 (3.92) years; range = 19 to 34] were randomly assigned to the programmed deceptive and the programmed non-deceptive groups as they arrived for testing in the Department of Defense Polygraph Institute (DoDPI) library. One subject was dropped from the study for refusal to participate or cooperate with the examiner. Therefore, ten subjects were assigned to each group and data from 19 males and 1 female were analyzed. Sex was not considered a factor in this study because of the likelihood of obtaining very few female subjects. Of the subjects that participated, all but 2 subjects reported themselves to be drug and medication free during the 24 hours prior to the study. Two subjects reported using antihistamines and pain killers during the 24 hours immediately preceding the study. All subjects, however, reported themselves to be in good health.

Examiners

The examiner was a Department of Defense certified PDD examiner with approximately 10 years experience as a U.S. Army Military Intelligence Division PDD examiner. The examiner was also trained in the use of the Axciton Polygraph system by DoDPI, and has used this system for at least 4 years in conducting field exams. The scorers were two certified PDD examiners trained in the DoDPI's test scoring methods. These examiners, with over 10 years experience each, had prior experience serving as independent scorers. The scorers were blind to the subject's group assignment.

Apparatus

An Axciton Computerized Polygraph System (Version 7.0, Axciton System, Inc., Houston, TX) was used to record skin resistance, respiratory, and cardiovascular activity. The data were saved on computer disks from which paper charts were produced for scoring. The Zone Comparison Test (ZCT) (Department of Defense Polygraph Institute, 1992) was the PDD test format used to test all subjects. Subjects were seated in a Lafayette adjustable-arm chair (Model no. 76871, Lafayette, IN) during PDD testing. Instructions to the subjects and a non-clinically based pretest explanation were recorded on videotape and presented using Sony Videocassette recorders (Model SVO-1610, Sony Electronics, Inc., San Jose, CA), and 19-inch Panasonic Video Monitors (Model CT 208VY, Panasonic Industrial Co., Norcross, GA). The item taken in the scenario was a DoDPI silver commemorative coin. The coin was approximately 42 mm in diameter and 2 mm thick (The coin was made by American Mint, Inc., Anniston, AL). On one side of the coin was the DoDPI emblem and on the other was the statement, "In Memory of James Hoffstein 1991." Both videotaped dialogues were recorded using a Panasonic System Camera (Model Digital 5010, Panasonic Industrial Co., Norcross, GA). The PDD examinations were videotaped using a

Panasonic video camera (Model WV CL 304) controlled with a Panasonic Digital audio visual mixer (Model WJAVE7). The questions presented in the PDD examination were digitized and recorded to a computer hard disk with a Sound Blaster board (Model 16ASP, Creative Labs Inc., Milpitas, CA). An interface (designed and built in-house) connected the computer parallel port to a Radio Shack (Fort Worth, TX) integrated stereo amplifier (Model SA-155) and two Radio Shack Speakers (Model Minimus-77) which were used to present the questions. This procedure insured that each question was presented with the same inflection, tone, and volume for each subject. Each of the rooms used in the study was 3.5 x 3.6 m and carpeted. Each room contained a one-way mirrored observation window. Both the examination room and the room in which the subject watched the first video contained video monitoring equipment. All three rooms were located in the same area of the DoDPI building, and within approximately 15 meters of each other.

Videotaped Dialogue

Videotaped recordings were made by an adult male Caucasian standing behind a waist high wooden podium. The background consisted of a navy colored cloth draped on a wall 50 cm to the rear of the speaker such that the entire background was covered. Approximately 40 cm to the rear of the speaker and immediately in front of the background were two eight-foot draped and crossed flag standards. The draped American flag was located to the narrator's right and the DoDPI standard, containing an image of the Institute's emblem was located to the narrator's left. This flag was draped such that the Institute emblem was not completely visible and any writing was also not completely legible in the video. The standards were also situated such that they appeared in the video to be to the narrator's rear and over his left and right shoulders.

Design

Equal numbers of subjects were assigned to a programmed deceptive and a programmed nondeceptive group. All subjects were tested using the ZCT in an attempt to detect the difference in programming. The programmed deceptive subjects engaged in a mock crime behavior which consisted of the theft of a silver commemorative coin from a room in a DoDPI building. The coin was reported to be valued at \$200. The programmed non-deceptive subjects went to the same room where the deceptive subjects found the coin, but simply filled out a 3x5 card with their names. Two "blind" independent scorers using the three position scale (see Zone Comparison Test [ZCT] Department of Defense Polygraph Institute, 1992), and ZCT scoring methods taught at DoDPI, scored paper charts of the tests.

Procedures

Prospective subjects were escorted to a subject briefing room (DoDPI library) where they were assigned to one of the two experimental conditions. They were then provided by the escort

with a copy of, and asked to read, a description of the research (see Appendix A). When the subjects completed reading this form and all appropriate questions had been answered, the escort asked each subject if he or she wished to participate in the study. One subject declined at this time and was escorted to another waiting area. Those wishing to participate were asked to read and sign a volunteer agreement affidavit. A copy of this form can be found in Appendix B. The escort then questioned the subjects sufficiently to complete a biographical and health questionnaire (see Appendix C). When this questionnaire was completed, the escort conducted the subject to the first room where the scenario was to begin. This room contained a desk, computer, video monitor, VCR, and several chairs. The video monitor and VCR were placed on a stand facing the door and situated such that the subject would immediately be aware of it upon entering the room. The desk, computer, and unused chairs were located on the unused side of the room. Here the subject was given an envelope and instructed to open and follow the directions in the envelope after the escort left the room. The escort then left the room.

The envelope given to each subject contained either written instructions for deceptive subjects (see Appendix D) or written instructions for non-deceptive subjects (see Appendix E). The instructions told the subject to: (a) read and follow instructions to perform a task in another designated room (both programmed groups had a task to perform); (b) play and view a videotape (the videotape dialogue is contained in Appendix F); and (c) upon completion of the task await the return of the escort. The other room the subjects were instructed to enter contained a desk and two tables upon which sat several laptop computers. The DoDPI commemorative coin and a 3 by 5 inch card were placed on a table in front of the door and situated such that the appropriate items for each subject would be in the subject's line of sight when he or she first entered the room. A collaborator monitored each subject's activities via a one-way mirror to ensure that they followed directions. Subjects were allowed up to 20 minutes to comply with the instructions. When the subject completed the tasks and the escort returned, the subject was taken to another room for the PDD examination.

Subjects arriving at the examination room were met by a PDD examiner, who made a self-introduction. After directing the subject to be seated, the examiner informed the subject to hold all questions until after the videotaped presentation. The examiner answered only those questions that in the examiner's best judgment would not compromise the study goals. This room contained two desks, a video monitor, VCR, and the Lafayette arm chair. The subject was seated in the Lafayette arm chair facing the video monitor from a distance of approximately 1.8 m. The room was arranged such that the examiner sat behind a desk across from and facing the examinee. The subject's chair was located slightly to the examiner's left and facing away from and perpendicular to the examiner. In other words the examinee could

only see the examiner by turning his or her head sharply to the left. The examiner then applied the sensors and began the videotaped pretest (see Appendix G). Subjects were informed how they were expected to answer each question by the examiner. Upon completion of the pretest, the in-test, which consisted of a ZCT, was begun. The questions used in the ZCT in-test are shown in Appendix H. The subject was videotaped during the PDD examination. When the examination was completed, the sensors were removed from the subject's body. The subject was then escorted by the escort to a waiting area (another part of the DoDPI library) where the subject was required to read and sign a subject debriefing statement (see Appendix I for a copy of the debriefing statement). The instructions for the escort may be found in Appendix J.

Data Reduction and Analysis

Each PDD test was independently scored by two certified PDD examiners. The evaluation consisted of scoring the test using the ZCT method taught as at DoDPI (Department of Defense Polygraph Institute, 1992) and indicating the resulting decision. For each examination, there were three possible decisions: no deception indicated (NDI), deception indicated (DI), and inconclusive (INC), or non-decision. The dependent measures were the number of decisions of each type made by each scorer. Since there was one chance in two of correctly identifying each subject, chance accuracy was 50%. Analysis included a test of significance of the proportionality between correct decisions and chance accuracy. The percentage of INCs or nondecisions were computed and recorded.

Results

When the data from the 20 subjects was examined, two PDD scorers made a total of 25 decisions (62%) out of a possible 40 decisions. The overall accuracy rate (INC's included) was 52.5%, with 45% for NDI decisions, and 60% for DI decisions. When INC's were excluded the percentage correct was 84%, and was significantly greater than chance ($p < .05$). The exclusion of inconclusives resulted in an increase in the percentages correct for NDI and DI decision calls to 75% and 92% respectively. The percentage of nondecision calls--INC calls or nondecisions--made by the scorers for the 20 subjects was 38%. Table 1 shows the accuracy of the blind scorers. In addition, Table 2 shows the decision outcomes as well as the numbers of innocent and guilty inconclusive calls made by each scorer.

Table 1
The Decision Accuracy for Each Scorer

Scorer	Decision		
	Correct	Incorrect	Inconclusive
1	10	2	8
2	11	2	7

Table 2
The Decision Outcomes for Each Scorer

Scorer	Decision outcomes					
	FP	FN	TP	TN	INC/G	INC/I
1	1	1	5	5	4	4
2	2	0	7	4	3	4

Note. FP = false positive; TP = true positive;
 FN = false negative; TN = true negative;
 INC/G = guilty inconclusive; INC/I = innocent
 inconclusive.

The blind evaluators agreed on 35% of the decisions regardless of whether those decisions were correct or incorrect. The application of a method (Fleiss, 1981) of evaluating agreement when multiple decisions are possible yields a kappa = .02, with an estimated variance = .03, and $z = 0.11$, $p > .05$. Therefore, the proportion of agreement among the among the decisions made by the evaluators did not differ from chance.

Discussion

The results of this study suggest that the coin theft scenario was not an effective laboratory mock crime procedure. However, the scenario did appear to be effective when scorers were willing to make a decision. Under these specific conditions the scenario met the requirement of an accuracy level of 80%. On the other hand, the large number of inconclusive outcomes (38% over the total subject population, or 40% and 35% for scorer 1 and 2 respectively) and low interrater agreement effectively diminishes the scenario's accuracy and therefore it's effectiveness. Inconclusive outcomes represent neither a correct decision nor an incorrect decision, while low agreement among scorer decisions limits confidence in scorer or instrument/procedure reliability. Therefore, any inferences about the efficacy of the scenario are limited to those situations in which scorers were willing to make a DI or NDI decision.

The high inconclusive rate suggests that many subjects did not show sufficient differential reactivity to the relevant and control questions for reliable scoring. Many subjects were drowsy and may not have been attending to the required task. During testing, sleepy subjects were allowed to stand and stretch to minimize the effects of inattention. However, examination of videotaped recordings showed that many subjects showed obvious signs of drowsiness ranging from outright nodding to unfocusing of the eyes and drooping of the eyelids.

Additionally, the low rate of agreement between examiners may be attributable to examiner evaluation skills, poor instrument sensitivity, or a combination of both. However, analysis of these factors are beyond the scope of the present study, but should be examined in the future.

Ten additional subjects were added at the end of the study (7 of which completed testing). The scorer's accuracy for these subjects can be seen in Appendix K. These subjects differed from the initial sample in that they were given a live pretest. The lack of a difference in accuracy between the initial sample and added subjects indicates that, in this case, a live pretest did little to alter the outcome. This finding, however, must be evaluated in the context of the small number of subjects given this treatment.

Since many of the subjects in this study showed signs of drowsiness, it is suggested that subjects who are less likely to be sleep deprived than military basic trainees be used in future studies. Fewer inconclusive outcomes were seen when subjects were not drowsy and were more attentive during testing. According to subject estimations of alertness and measures of body temperature, subjects should be more alert in the morning, or late afternoon and evening (Monk, Leng, Folkand and Weitzman's study [as cited in Monk, 1991]). Therefore, it is recommended that these times might be better suited for subject testing.

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Appendix A

Description of Research

**** DODPI96-P-0003 ****

WELCOME: Welcome to the Department of Defense Polygraph Institute (DoDPI). This may be the first time you have participated in a research project, so we would like to provide you with some information concerning your visit today. PLEASE REMEMBER that your participation is entirely voluntary - you are free to leave at any time. If you have any questions, please feel free to ask the individuals assisting you.

PROJECT TITLE: Test of a Mock Theft Scenario for Use in the Psychophysiological Detection of Deception: I

PRINCIPAL INVESTIGATOR: Eben M. Ingram, Ph.D., Research Psychologist, DoDPI Research Division.

BACKGROUND/SIGNIFICANCE: The psychophysiological detection of deception (PDD) is a process designed to determine whether an individual is responding truthfully to a series of questions. PDD is commonly called "lie detection" or "polygraph" test. The process is based on the assumption that an individual who is deceptive (i.e., lying) has a greater response in some body systems than a person who is not. While this is generally true, we are always seeking methods of improving the process.

PURPOSE OF STUDY: This study is designed to test the effectiveness of a subject programming scenario.

YOU SHOULD NOT PARTICIPATE IN THIS STUDY IF ANY OF THE FOLLOWING ARE TRUE:

- 1) I am currently taking prescription medication other than for pain due to injury.
- 2) I have a history of dizziness or fainting spells.
- 3) I have been diagnosed with a heart condition.
- 4) I have been diagnosed with high blood pressure.
- 5) I have been diagnosed with a respiratory ailment, such as asthma or emphysema.
- 6) I currently suffer from an acute health problem such as a cold, active allergy problem, hemorrhoidal problem.
- 7) I am currently being treated for psychological problems with anti-psychotic medication.
- 8) I am pregnant (females only).

PROCEDURES: During this project you will be asked to participate in a research session lasting approximately 3 hours. You will be asked to enter a room, remove something from that room, and, possibly, to lie about what you took from the room during a PDD examination. Some people will be instructed to lie about what they took from the room and some will be asked to answer truthfully about their involvement. If you are instructed to be deceptive about what you took from the room, YOUR JOB IS TO LIE SUCCESSFULLY, to the PDD examiner concerning what you took from the room.

Participation in the PDD process is relatively simple. The examiner will ask several questions concerning your age, health, and normal daily activities. A theory of the psychophysiological detection of deception will be explained and the questions you will be asked during the examination will be reviewed. The examiner will then attach sensors to your body.

DESCRIPTION OF SENSORS USED AND THEIR ATTACHMENT: Two metal plates will be placed on the first and third fingers of the left hand for the purpose of recording sweat gland activity. Two rubber pneumatic tubes will be attached such that they will encircle the chest and stomach. These tubes transmit changes in breathing to the computer. Finally, a blood pressure cuff will be attached to the upper arm for the purpose of recording changes in blood pressure. You will be asked to sit still for several minutes while the examiner asks the questions that were reviewed earlier. The examiner may ask the same questions several times during the examination. When the examination is finished, the sensors will be removed, you will be asked to sign a debriefing confidentiality statement, and you will be escorted out of the building. Unfortunately we will not be able to tell you the results of your examination because the data analysis and reduction process will not be completed today.

DISCOMFORTS: During a PDD examination, some people find it difficult to sit still for several minutes at a time while physiological reactions are recorded. The sensors used may also be uncomfortable. The examiner is sensitive to this discomfort and will attempt to make the process as brief as possible. The actual PDD tests last only a few minutes each. While you may be asked to participate in several tests, the total length of time that you will actually be participating in a polygraph examination is considerably less than the 3 hours we ask you to remain here for.

TAPE-RECORDING: Examinations conducted during this project may be recorded on audio or video tape using wall and ceiling mounted video cameras/microphones and commercial recorders. The recordings are made for quality control purposes.

RISKS: There are no known risks involved in this study.

CONFIDENTIALITY OF RECORDS: You will not be asked any personal questions by the examiner, except medically related information necessary for this study. Neither your identity nor any information you reveal during this project will be released to anyone not directly involved in the research. **THE LEGAL AUTHORITIES ENTITLED TO REVIEW RESEARCH RECORDS FOR ADHERENCE TO HUMAN USE REGULATIONS** is the Office of the Surgeon General Human Use Committee.

YOUR RIGHTS: You have the right to ask questions about any aspect of your participation in the study. If problems arise at any time in conjunction with your involvement in the study you should contact Eben M. Ingram, Ph.D., (205) 848-3803/-5782 Department of Defense Polygraph Institute Fort McClellan, Al. 36205. If you believe you have been injured as a result of participating in this study you should contact the Commander of the Noble Army Community Hospital, Fort McClellan, Alabama, 36205, telephone number (205) 848-2200.

VOLUNTARY PARTICIPATION: Your participation in this study is completely voluntary. **If you would prefer not to participate, do not volunteer for it!** Even if you decide to participate in the study, you may discontinue at any time without penalty or loss of benefits to which you are entitled. Should you decide not to participate, please inform your escort, or if it occurs during the polygraph examination itself, inform the examiner and you will be released without penalty.

ADDITIONAL COMMENTS: It is very important that you convince the examiner that you are being absolutely truthful during the examination. It is also VERY IMPORTANT that you do not discuss your experiences in the PDD examination with your fellow research subjects. If you discuss your experiences during the PDD examination with others you will be withdrawn from the study without further benefit.

Appendix B

Volunteer Agreement Affidavit

** DODPI96-R-0003 **

Subject #: _____ Name: _____
SSN: _____/_____/_____ Date of Birth (Mo/Da/Yr): ____/____/____
Place of Birth: _____
Home Address: _____
City _____ State _____ Home Phone Number: _____

This form is affected by the Privacy Act of 1974.

AUTHORITY: 10 USC 3013, 44 USE 3101 and 10 USC 1071-1087, and E.O. 9397.

PRINCIPLE PURPOSE: To document voluntary participation in a DoD Polygraph Institute Research Program.

ROUTINE USES: The SSN and home address will be used for identification and locating purposes only. Information derived from the study will be used to document the study, adjudication of claims, and for mandatory record keeping associated with human use in government research. Information may be furnished to Federal agencies.

VOLUNTARY DISCLOSURE: Failure to furnish requested information will preclude your voluntary participation in this investigational study.

PERSONAL STATEMENT

I am at least 19 years of age and do hereby volunteer to participate in a research study titled "Test of a Mock Theft Scenario for Use in the Psychophysiological Detection of Deception (DoDPI96-P-0011)", being conducted by Eben M. Ingram, Ph.D.

1. I understand that I am participating in a research study to examine several measures and techniques, some of which are currently employed in criminal and/or security screening situations where the psychophysiological detection of deception (PDD) is used. PDD is commonly called a 'polygraph test' or 'lie detection'.

2. To the best of my knowledge, none of the following are true:

1) I am currently taking prescription medication.

- 2) I have a history of dizziness or fainting spells.
- 3) I have been diagnosed with a heart condition.
- 4) I have been diagnosed with high blood pressure.
- 5) I have been diagnosed with a respiratory ailment, such as asthma or emphysema.
- 6) I currently suffer from an acute health problem such as a cold, active allergy problem, hemorrhoidal problem.
- 7) I am currently being treated for psychological problems with anti-psychotic medication.
- 8) I am pregnant (females only).

3. I am aware that my participation in this study will require approximately 3 hours of my time, and that I may be asked to conceal information concerning my activities during this study from a trained PDD examiner.

4. I understand that study I will be participating in a PDD examination and that I will be asked to sit still for several minutes at a time during the examination.

5. I understand that there are no known dangers or risks associated with my participation in this study.

6. Two metal plates will be placed on the first and third fingers of the left hand for the purpose of recording sweat gland activity. Two rubber pneumatic tubes will be attached such that they will encircle the chest and stomach. These tubes transmit changes in breathing to the computer. Finally, a blood pressure cuff will be attached to the upper arm for the purpose of recording changes in blood pressure.

7. I understand that my participation may be recorded on audio or video tape and that the recording will be maintained as required by law.

8. I understand that I will receive no reward or benefit of any kind beyond those I have agreed to.

9. I understand that I may terminate my involvement in this study at any time and for any reason, without penalty.

10. I understand that my participation in this project will be terminated if I discuss project details participation with anyone except project supervisory personnel. NOTE: Discussion of details with others could invalidate the data collection.

11. I understand that I should contact the principal investigator, Eben M. Ingram, Ph.D., (205) 848-3803 Department of Defense Polygraph Institute Fort McClellan, AL or, Mr. Michael Capps, Director, (205) 848-3803; Department of

Defense Polygraph Institute, Fort McClellan, AL, if I have any concerns or complaints regarding this study.

12. I understand that any questions concerning my rights relating to study-related injury should be directed to the appropriate authority. The appropriate authority is the Commander of the Noble Army Community Hospital, Fort McClellan, Alabama, 36205, telephone number (205) 848-2200.

13. I have been given a thorough explanation of my role in this research project. I have been given a chance to ask any questions I have concerning the project and all questions have been answered to my full satisfaction.

Subject Signature

Witness Signature

Printed Name

Printed Name

Appendix C

Biographical/Medical Questionnaire

** DoDPI96-P-0003 **

Subject number: _____

Date of completion: _____

Please carefully complete all of the blanks below:

Name (Please Print): _____

Gender: ()M ()F

Age: _____

Occupation: _____

Hours of sleep last night: _____

Previous PDD Examination: ()Yes ()No

Have you ingested alcohol, nicotine, or caffeine (including coffee, tea, soft-drinks, and chocolate) within the last 24 hours? ()Yes ()No

If so, what and when? _____

How would you describe your present health and physical well being? ()Excellent ()Good ()Fair ()Poor

Are you presently under a physician's care and are you taking any medication? ()Yes ()No

If so, for what condition? _____

Please identify the type, dosage, and last time any medication was taken: _____

Are you experiencing any pain or discomfort today? ()None ()Mild ()Moderate ()Severe

Reason for any pain or discomfort today: _____

Please note reason(s), if examinee is unsuitable for testing: _____

Appendix D

Written Instructions to Deceptive Subject

** DODPI96-P-0003 **

Thank you for agreeing to participate in this study. Your task today is to take a rare and valuable coin from a room across the hall, then successfully lie about taking the coin during a psychophysiological detection of deception (PDD) examination. To complete your task, you must not admit to the PDD examiner that you have seen, taken, or have possession of the coin. You must be convincing and make every attempt to hide the fact that you have taken the coin. If you do not think you can complete this task, please open the door to the room you are in and wait for your escort to return.

We require that you complete the following tasks, without assistance, in the order given.

Please:

1. Go across the hall and enter room R-103 .
2. Locate the 3" x 5" card and the small cloth bag on the table.
3. Open the cloth bag and locate the date on the coin. Return the coin to the bag. Using a pencil from the table, write your name on the 3" x 5" card, then write the date from the coin on the 3" x 5" card.
4. Conceal both the 3" x 5" card and the cloth bag containing the coin on your person. Hide them in your pocket or somewhere else on your clothing where others cannot see them. Do not put them in a purse or notebook.
5. Return to the room (E113) where you received these instructions and close the door.
6. Press the PLAY button on the video cassette player and watch the videotape. When the tape is over, press the STOP button on the video cassette player.
7. Take all of your personal property and step outside the door to meet the escort. You will not be returning to this room.

Appendix E

Written Instructions to Non-deceptive Subject

** DODPI96-P-0003 **

Thank you for agreeing to participate in this study. Your task today is to be absolutely truthful during a psychophysiological detection of deception (PDD) examination. You should not lie to the PDD examiner about anything today. You have done nothing wrong and have no knowledge of anyone else doing something wrong. Be absolutely truthful throughout the PDD examination. If you do not think you can complete this task, please open the door to the room you are in and wait for your escort to return.

We require that you complete the following tasks, without assistance, in the order given.

Please:

1. Go across the hall and enter room R-103.
2. Locate the 3" x 5" card on the table.
3. Use a pencil from the table to write your name on the 3" x 5" card.
4. Conceal the 3" x 5" card on your person. Hide it in your pocket or somewhere else on your clothing where others cannot see it. Do not put it in a purse or notebook.
5. Return to the room (E-113) where you received these instructions and close the door.
6. Press the PLAY button on the video cassette player and watch the videotape. When the tape is over, press the STOP button on the video cassette player.
7. Take all of your personal property and step outside the door to meet the escort. You will not be returning to this room.

Appendix F

Videotaped Instructions to Subjects

** DoDPI96-P-0003 **

Hello and welcome to the Department of Defense Polygraph Institute research project. My colleagues and I would like to thank you for taking part in this study. One of our jobs is to improve the psychophysiological detection of deception examination process. The process used to be called a polygraph or lie detector test. We now call it a psychophysiological detection of deception, or PDD for short, examination--to more precisely describe the process. You've probably seen people taking PDD examinations in movies or on television. The PDD examinations in the movies and television are usually similar to but not exactly like a real PDD examination - so don't be surprised if this process is not exactly what you expect.

One of the methods we use to test our procedures and equipment is a laboratory test. The PDD examiner actually administering the test does not know who is truthful and who is not. The entire purpose of the examination is to see if the equipment and/or examiner can determine who is truthful. We want you to assist us by convincing the examiner that you are being truthful. Thus, your job today is to convince the PDD examiner that you are telling the truth.

As you read earlier, the examiner will attach sensors to your body to measure your physiological responses. The examination questions will be about a coin which was taken from a room down the hall. The examiner doesn't know if you took the coin. I don't know if you took the coin. The escort you met earlier doesn't know if you took the coin. Only you and the person who originally filled the envelopes know who took the coin. It is VERY IMPORTANT that you do not tell anyone if you took the coin.

The PDD examiner will present the same questions to everyone. The questions concern the missing coin. The question will be presented by audiotape so that they will be the absolute same for everyone. Again, the examiner doesn't know if you took the coin. If you didn't take the coin, you will not need to lie today. Simply tell the truth during the test--that you didn't take the coin and don't know anything about it. If you took the coin, we want you to deny taking it when asked if you took it. In other words we want you to lie about taking the coin. If you didn't take the coin and you deny taking it, then you will be telling the truth. Again, your job today is to convince the examiner that you are being completely truthful--whether you are or not.

Thank you again for your assistance with this project. When you open the door to this room someone will escort you to the PDD

examination room. If you have any questions which have not been answered, please ask the escort. Due to the nature of this study the escort can answer only a limited number of questions. The escort will say "I can't answer that" if you ask something the escort is not allowed to answer.

Again, your job is to convince the PDD examiner that you are being truthful about the coin-whether you are being truthful or not. We appreciate your assistance with this project.

Good luck during your examination!!

Please press the stop button on the video cassette player now.

Appendix G

Videotaped Explanation of Procedures and Pretest

** DoDPI96-P-0003 **

Earlier today a coin was taken from room R-103 in this building. We know that the coin was taken because we've already tested Mr. Dole, the person who reported it missing, and the only employee who knew the coin was here. We're confident that Mr. Dole knows nothing about the coin's current location.

The missing coin was the tenth of ten solid silver commemorative coins. The silver in the coin alone is worth around \$200.00. This coin was special, however, because it donated to the institute by Mrs. James Hoffstein in memory of Mr. Hoffstein. Mr. Hoffstein was a pioneer in the use of physiological reactivity during the detection of deception. Unfortunately, he died of heart disease last year. Whoever took that coin has robbed the Department of Defense Polygraph Institute of it's chance to show tribute to a fine man.

We're just trying to locate the coin. While we don't really suspect that you took the coin, we know you could have because you were one of the people seen outside of the room the coin was taken from. We're testing everyone who was seen outside of that room.

Before we begin the examination, I will explain how the polygraph instrument is used to determine if someone is lying. This instrument amplifies and records activity from your body. Today we will use: (a) Two small flat metal sensors will be attached to the first and third fingers of your the left hand, (b) expandable tubes will be placed around the upper chest and abdomen, and (c) an occlusive blood pressure cuff will be placed around the upper right arm.

Research indicates that the signals recorded from these sensors are normally constant. When an individual becomes aroused or is stimulated, as occurs when lying, the signals change.

Basically, the brain and parts of the nervous system control the level of physiological activity in the body. When a person is asked a question that they know the answer to, there are two basic mental processes that occur in the brain. First, the person understands the question. Second, the correct answer is automatically determined and/or recalled. For example, if I ask the question, "Are you in the state of Alabama?." As soon as your brain understood the question, it (the brain) located and identified the truthful answer, which is YES. Your brain did not

first decide that you were in Alaska, and then correct itself. The brain identified the truthful answer before you even decided to say YES or NO. If you had decided to say YES, there would have been no mental stress or struggle within yourself to answer that question because your brain knew the answer to be YES and it could have easily caused your mouth to say YES. If you decided to lie about the state you are in, you are causing your brain to expend extra mental effort to change the automatic truthful response into a deceptive response. During this conscious mental effort to lie, the brain changes (decreases) its monitoring of other body activities, such as breathing, heart beating, and sweat gland activity, so their level of activity changes. When you tell the truth, physiological activity changes very little. Lying takes more mental effort. When a person lies, physiological changes occur in their body because the brain changed the amount of energy it was using to control those activities. The polygraph instrument is constantly recording the level of physiological activity within the body, so the changes resulting from a person telling a lie are recorded and can be identified.

Have you ever told a lie? You probably have. Most of us do at some time. Do you remember how you felt when you told that lie? Think of a time when you told a lie to someone important to you - such as your mother or father; a minister or teacher; a policeman; your brother or sister; possibly a close friend or spouse. Do you remember how you felt? Maybe your heart sped up; you breathed more quickly than usual; you felt sweaty; your face felt warm or turned red. Did you tell your body to respond like that? No. These were automatic physiological reactions. They indicate that your body is reacting to stress. When people lie, there is a physiological reaction. It may be large enough for everyone to notice or so small that even the liar doesn't notice it. That reaction is measured during a PDD examination. A PDD examination works because an instrument is used to amplify and measure these physiological reactions. A trained examiner is able to look at recordings and determine if there are unusual reactions following certain questions. These reactions may indicate that a person is lying. There is nothing magical or mystical about a PDD examination-it is simply the recording, amplification, and interpretation of the examinee's--your-physiological reactions.

Are you a good liar? Some people think they are. It is extremely difficult to successfully lie during a PDD examination. Research indicates that only people with "superior intelligence and great emotional control" can successfully lie during a PDD examination. Hopefully you are just such a person. Remember, your job today is to convince the examiner that you are being truthful about coin. If you feel yourself reacting during the test, simply relax and stop reacting. If you feel your heart

speed up, relax to slow your heart down. If you feel yourself breathing strangely or unevenly, relax and breathe normally. If you feel yourself react in any way, simply try to stay calm and relaxed.

During the examination, I would like for you to sit up straight and look straight ahead. Try not to move your body or head during the examination. Such movements will change the signals from your body and I will have to repeat the question, and possibly the complete examination.

I will now present all of the questions that you will be asked today.

If you were asked, Are the lights on in this room? -pause- How would you answer? Please answer aloud so that the examiner can hear you. When we are conducting the test, You must answer aloud with a YES or NO to each question. During the test we also want you to answer each question the same as you answered it at this time. Please listen and respond to each question truthfully. If you have any questions at all or are unsure of the truthful answer please ask the examiner.

1. Are the lights on in this room?
2. Regarding that stolen money, do you intend to answer truthfully each question about that?
3. Are you completely convinced that I will not ask you a question on this test that has not already been reviewed?
4. Prior to 1996, did you ever lie to someone who trusted you?
5. Did you take that silver coin?
6. Prior to coming to Alabama, did you ever lie to keep out of trouble?
7. Did you take that silver coin from room 103?
8. Is there something else you are afraid I will ask you a question about, even though I have told you I would not?
9. Prior to this year, did you ever steal anything for personal gain?
10. Do you know where that stolen silver coin is now?

During the test if the examiner judges that you are moving excessively or sleeping, the examiner will ask you to "please remain still".

Remember that you should answer each question truthfully. At the start of the test, you will hear the message "The test is about to begin". When this happens, you should sit perfectly still, answer all questions truthfully, answer immediately after the question is asked, and keep your eyes open during the test." The remaining questions will then be repeated. When you hear the statement "This portion of the test is now complete, please remain still until you are told to relax and that it's OK to move. We need a few seconds before you move to power down the amplifiers, so we don't damage the instrument.

Sometimes there are problems with the recording because examinees do not remain still. If this occurs, you will hear the message "Please remain still", then the question will be repeated. This is fairly normal, so don't be surprised if a few questions are repeated today. "Do you have any questions?"

Appendix H

Test Questions
** DODPI96-P-00xx **

- X The test is about to begin.
1. Are the lights on in this room?
 2. Regarding that missing silver coin, do you intend to answer truthfully each question about that?
 3. Are you completely convinced that I will not ask you a question on this test that has not already been reviewed?
 4. Prior to 1996, did you ever lie to someone who trusted you?
 5. Did you take that silver coin?
 6. Prior to coming to Alabama, did you ever lie to keep out of trouble?
 7. Did you take that silver coin from room R-103?
 8. Is there something else you are afraid I will ask you a question about, even though I have told you I would not?
 9. Prior to this year, did you ever take anything that didn't belong to you?
 10. Do you know where that missing silver coin is now?
- XX This portion of the test is now complete, please remain still until the examiner tells you to relax and that it's OK to move.

Appendix I

Subject Debriefing Statement

** DODPI96-P-0003 **

Now that you have completed your examination, the entire project staff sincerely thanks you for your help. Your work here may be more important than you realize.

If you participated in attempting to deceive the PDD examiner, you are assured by the project staff that you in no way violated any rule or law. The deception was required for investigational purposes only. If you actually took the coin, please return it to the escort accompanying you away from the examination room. Regardless of the role you played, it is our hope that you were made to feel as comfortable as possible throughout the study. If you do have concerns or questions regarding your participation, please make them known to the principal investigator, Eben M. Ingram, Ph.D., Research Psychologist; (205)848-5782; Department of Defense Polygraph Institute.

Finally, it is VERY IMPORTANT that you DO NOT discuss the details of this study with anyone else. One of your friends, or a friend of a friend, may decide to participate in this or a similar study someday. If they know the details of the investigation process, they could be disqualified from participating in a study and/or unconsciously influence the results of the study using their knowledge.

Please sign this form in the space provided to indicate that you understand the instructions provided above.

Subject Signature

Printed Name

Date

Subject #: _____

Appendix J

Instructions for Subject Escort

** DoDPI96-P-0003 **

Inappropriate and/or non-uniform interaction with human subjects can bias and/or invalidate the results of a study. For this reason, the escort occupies one of the most sensitive and important positions in data collection. The escort should interact with all subjects in a pleasant professional manner. While it is understood that this cannot be done precisely, the escort should attempt to say the same things, at the same time, and in approximately the same manner to each subject. Every attempt should be made to interact with males, females, programmed innocent, programmed guilty, and minorities in exactly the same manner. If an escort is unsure what to do in a particular situation or cannot answer a question, the principal investigator (PI) should be contacted to resolve the issue. The escort should note that the PI was contacted to resolve the problem to ensure appropriate credit for the decision.

During this study, the escort is required to:

1. Ensure that: a) all forms are ready; b) the 3" x 5" card, and coin if necessary, are placed in the target room; c) the scenario video cassette tape is rewound and in the player; d) the scenario television and video cassette players are turned on; and e) (if specified) the subject recording devices are turned on and the media is prepared. It is the escort's responsibility to ensure that the session is recorded-as specified in the main protocol.
2. Greet subject (when subject enters building or in waiting area).
3. Introduce yourself.
4. Ask if subject needs to use toilet or would like a drink of water. If subject says yes, guide subject or give directions as appropriate.
5. Escort subject to briefing room and direct subject to sit at table/desk.
6. Direct subject to read Description of Research.
7. Answer as appropriate the subjects' questions.
8. Ask if subject wants to participate in the study. If subject doesn't wish to participate: a) inform PDD examiner; b) escort subject back to waiting area or out of building as appropriate. If subject will participate, instruct subject to complete the Volunteer Agreement Affidavit. Again, answer all of the subjects' questions as appropriate.
9. Assign subject a number from list provided by principal investigator.
10. Complete the Biographical/Medical Questionnaire for the subject. Question the subject where necessary.
11. Ask if subject needs to use toilet or would like a drink of water. If subject says yes, guide subject or give directions as

appropriate. Remind subject that it may be an hour or so before the next opportunity to use the toilet or drink. If subject is wearing clothing which could interfere with sensor placement, remind the subject that the examiner may request the removal of the clothing or some other accommodation for sensor placement be made.

12. Give subject the envelope containing the subjects' instructions and leave the room (envelope will already have the subjects number on it).

13. Give the subject's completed Biographical/Medical Questionnaire to the PDD examiner. File the subject's completed Volunteer Agreement Affidavit.

14. Watch subject via the closed circuit television and / or the one-way mirror. If subject has obvious problems following the written instructions (e.g., doesn't leave room, plays video tape before leaving room), inform the subject that their participation will not be permitted due to their inability to follow instructions - and escort the subject to the waiting area or out of the building. If subject has problems that are not related to following the written instructions (e.g., no writing instrument available, can't get VCR to work, missing forms), go to room and assist subject in resolving the difficulty.

15. When the subject has followed all written instructions and opened the door to the room, escort the subject to the examination room.

16. Make sure subject took the 3" x 5" card (and the coin if subject is programmed deceptive) from the target room. If the subject did not complete the 3" x 5" card or failed to take the coin when it should have been taken, contact the examiner and abort the session.

17. When the examination is over, 1) escort subject to another room, 2) obtain signature on Subject Debriefing Statement, 3) retrieve 3" x 5" card (and coin if appropriate), and 4) escort the subject out of the building or to the waiting area as appropriate.

18. Make sure all information pertaining to that subject's test are completed and filed correctly.

Appendix K

Study Design Changes

** DoDPI96-R-0003 **

The initial sample, which consisted of 20 subjects, was increased by 10 additional subjects. Seven of the 10 additional subjects completed the study. When the data from the last seven subjects is examined by itself the proportion of decisions made (8 out of 14 possible for 57%) and the percentage of correct calls (75% correct) decreases. In addition, the percentage of correct calls was not significantly greater than chance ($p > .05$). Furthermore, the percentage of non decisions increases (43%). Table K1 shows the numbers of correct, incorrect, and inconclusive calls made by the blind scorers for the added subjects and the initial sample.

A comparison was made between the first 20 subjects and the last 7 subjects, and no significant ($p > .05$) improvement or reduction in accuracy was found as a result of the addition of the live pretest.

Table K1

Outcome of Scorer Decisions for the
Initial 20 Subjects, and the Subjects
Added at the End of the Study

Scorer	<u>Correct</u>		<u>Incorrect</u>		<u>Inconclusive</u>	
	AS	IS	AS	IS	AS	IS
1	2	10	1	2	4	8
2	4	11	1	2	2	7

Note. AS = added subjects; IS = initial subjects.